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Inequality in the distribution of household expenditure in Cameroon: A Gini decomposition analysis based on the Shapley-value approach.

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On the basis of data drawn from two household surveys, this paper investigates the evolution of income distribution inequality in Cameroon between 1984 and 1996, a period characterized by a serious economic crisis. The paper decomposes inequality into within- and between-groups components, using the Shapley-value approach and total expenditure per adult equivalent as a welfare indicator to find the contributions of these components to overall inequality at the national level. Decompositions are carried out according to household socio-economic characteristics such as the residence area,the stratum, the educational level, the gender, and the age group of the household head.The study results indicate that inequality in total expenditures declined only slightly between 1984 and 1996,and that the contributions of within-groups inequality components to overall inequality for all the five household socio-economic characteristics analyzed in the study, overwhelmingly explain total inequality at the national level in Cameroon. The policy implications of the study for each of the five household socio-economic characteristics considered revolve around the main conclusion of the paper according to which the reduction of inequality in Cameroon, as in most African countries, depends not only on the design and implementation of growth policies conducive to poverty and inequality reduction, but also on the political will of decision makers who should be motivated to optimize social welfare for their populaces while achieving social justice in terms of equity in the distribution of income.

Keywords: Total expenditures, inequality, decomposition, Gini coefficient, Shapley-value, inequality components, economic crisis, Cameroon.

INTRODUCTION

The evolution and analysis of inequality is a subject of preoccupation for researchers and decision makers alike. In recent years in effect, many empirical studies have highlighted an increase in inequality both in developed and developing countries (Piquetty, 1994; Kanbur and Lustig,1999; Milanovic, 2002; Bourguignon and Morrison, 2002).This empirical evidence has had a con-siderable impact on theoretical investigations of in-equality,and has led to the manifestation of a remarkable vitality in economic theory as concerns the measurement of inequality,in addition to renewed interest in the decomposition of inequality.

Decomposition analysis may be divided into two categories.The first category is concerned with the decomposition of individual or household income or expenditure inequality in the distribution of these welfare indicators into different components which may be considered as the socio-economic sources of inequality.It underscores the contributions of these components to overall inequality and may help in the design of effective economic and social policies to reduce inequality and poverty.

The second category of decomposition analysis deals with the breakdown of income or expenditure into population sub-groups (Decomposition into population groups is the main approach used to measure how education, age,etc affect inequality.This approach starts with the division of a sample into discrete categories (for instance,rural and urban residents, individuals with a primary,secondary level of education, etc.),and then follows with the calculation of the level of inequality in each sub-sample and between the means of sub-samples).

It shows that total inequality is the sum of within and between-groups inequalities (Bourguignon, 1979;Cowell,

1980;Shorrocks,1980;Shorrocks,1984).The practical significance of the distinction between these two components or sources of inequality resides partially in the capacity to perceive the contribution of socio-economic factors underlying in-equality and the conception of policies impacting on this phenomenon.It also resides in the impact of economic policies on vulnerable groups and the role groups rather than what disorganized individuals can play in affecting the evolution of economic inequality (Champernowne and Cowell,1998).One of the problems inherent in these ana-lyses is the decomposition methodology itself and the choice of appropriate welfare indicators (Fei et al.,1987;Lerman and Yitshaki,1985; Shorrocks,1982).

This study deals with the second category of decomposition analysis mentioned above.It examines the evolution of welfare inequality in Cameroon between 1984 and 1996,using both household expenditure data and the Gini index and its components as derived from the Shapley-value decomposition approach.Decompositions of inequality into components are carried out to identify the sources or household socio-economic characteristics underlying inequalities according to the residence area,the stratum,the educational level,the gender, and the age group of the household head.The data used in the study are drawn from the Household Consumption Survey (EBC) and the Cameroonian Household Survey (ECAMI) conducted respectively in 1984 and 1996 by Cameroon's Division of Statistics and National Accounts (DSCN).

As a background to economic and social developments in Cameroon, the choice of the study period is motivated by the fact that Cameroon suffered from a serious and long-lasting economic crisis during the period 1984-1995 after two decades.This is characterized by a sustained average GDP growth rate of 7% from independence in 1960 to 1985, and is driven by a rapid agricultural sector development and the exploitation of newly discovered oilfields which came on stream in 1978.This crisis was caused in the mid-80s by both domestic macroeconomic mismanagement and political instability.In addition there were concurrent external shocks, including a significant depreciation of the US dollar and a persistent fall in the world prices of oil and traditional agricultural export crops (cocoa, coffee, cotton, etc.) which led to a fall of 60% in the country's external terms of trade.

Confronted with this situation, the Cameroonian Government in the fiscal years, 1986 and 1987 attempted to stem the tide of the crisis by implementing an economic stabilization program which failed.But from 1988 to 1993, it put in place a series of economic and structural adjustment programs (SAPs) supported by the IMF and the World Bank, whose goals were to liberalize the economy and to shift the country back into an economic recovery and growth path through private sector development instead of central planning.The policy measures taken in this context included drastic cuts in government expenditures, revenue collection enhancement, public service reform, trade liberalization, reform and privatilization of public enterprises and parastatals, banking sector restructuring, and the improvement of the performance of domestic and external public debt management to restore the country's credibility with its traditional financial backers.

These reforms did not stem the tide of the crisis and average GDP growth rates continued to fall from a low of -2.2% during the periods, 1985-1990 until the recession hit rock bottom with a growth rate of -10.3% in 1993, and until a strong trend reversal materialized after external adjustment, consisting of a CFA franc devaluation vis-à-vis the French franc, took place in January 1994 and led to economic recovery and positive growth in 1995 (World Bank, 1995).

The economic crisis and the implementation of these reforms and growth recovery measures had dire consequences on the living standards of the country's population, since overall, real GDP fell by a third (or by more than 50% on a per capita basis) and consumption per head decreased by 40% between 1985 and 1993. Given the fact that the government priority objectives were to service its external debt which had increased from less than a 1/3 of GDP in 1984/85 to more than 3/4 of GDP in 1992/1993, and to eliminate serious public finance imbalances,the reduction of public spending meant that public investment fell from 27% to 13% of GDP during the same period,and as the major employer of the country,the government was compelled to freeze the recruitment of job seekers and to effect drastic cuts in public service salaries in January and November 1993 (After these two salary reductions in January and November 1993,the total cut in high salaries amounted to 60%) and manpower of the Public Service,thus driving thousands of government employees either into unemployment and poverty or into the informal sector of the economy (See, Fambon et al. (2005) where the majority of urban dwellers eke out a living (World Bank, 1995,2000,2001).In addition,given that government spending in most social sectors such as health, education,and social infrastructure building was already inadequate, the effects of these cuts in public expenditures were a deterioration of social service delivery systems, increased limited access to these services by the majority of the population, and the worsening of the living conditions of the poor.

As regards the liberalization of the economy, the vast program of privatization and restructuring or liquidation of public enterprises and parastatals also had the same consequences, since the State proceeded to disengage from the productive sector of the economy and to deregulate the private sector which was supposed to become the engine of growth and development.It is estimated that, between 1984 and 1991, 21% of private sector employees were made redundant, in addition to those Fired or forced into involuntary retirement from govern-

ment-owned enterprises.

However, the disengagement of the State from the agricultural sector had its greatest and most serious impact on the rural households, since most government support programs for agricultural production, domestic marketing and export of cash crops were abolished. The farmers were left to fend for themselves in finding the inputs and credit needed and previously provided by the government for the production and marketing of export crops on which their livelihood essentially depends the most.

Therefore, it may generally be said that the consequences of the economic crisis and the implementation of economic recovery and growth measures were devastating for the welfare of the population. In fact, the 1984 consumption budget survey (EBC) mentioned above reveals that, in general, 40% of the population were living below the poverty line in the early 1980s, and that poverty was essentially a rural phenomenon where unemployment was high in the urban areas, particularly among women and the youth (25% in Yaoundé, for instance).In the rural area taken as a whole, the survey showed that, owing to the presence of the Dutch disease syndrome brought about by the exploitation of oil, production in the non-oil sector, particularly in the agriculture sector, was already decreasing and rural unemployment was rising even before the advent of economic crisis, thus increasing rural exodus (Fambon et al.,2005). The survey also found that overall inequality was about 40% at the national level, but it did not carry out a decomposition of its components to find out the sources and contributions of inequality to overall inequality.The present study will attempt to analyze both the evolution and decomposition of inequality to fill this gap which may eventually serve as a guide for policy actions in favour of an equitable distribution of welfare in Cameroon.It decomposes the Gini index using Shapley's value to identify the causes of inequality.

METHODOLOGICAL FRAMEWORK

The first decision the researcher must make in analyzing poverty and income inequality is to select the welfare indicator to be used. In accordance with several recent studies carried out in Cameroon and elsewhere (Coulombe and McKay,1998; Menjo, 2006; Fambon, 2006), this study uses a monetary measure of utility and welfare. In this respect, total household consumption expenditure will be used as a household welfare measure and as a basis for ranking households. In addition, total household consumption expenditure per adult equivalent is also used to represent household living standards. This indicator is the total expenditure of a household divided by the equivalent scale, which is 1 for each adult and 0.5 for each child. This represents the conventional equivalent scale that was widely used in other studies. During the period of our study (1984-1996), Cameroon witnessed a non- negligible average inflation rate of about 6.6 %; under these conditions, total household expenditure at 1984 constant prices was deflated with the consumer price index with a base year of 1996. This technique thus helps express the 1984-expenditure per adult equivalent at 1996 prices. In other words, this ptovides us with the real expenditure per adult equivalent as a measure of household welfare.

Several inequality measures can be found in the literature (Inequality measures are well-documented and explained in many papers and books, notably, in Jenkins (1995) and Sen (1997) and in practice, none of them can be considered better than others. However, the Gini coefficient is the inequality index most used by researchers because it is easier to interpret in terms of Lorenz curves. The Lorenz curve relates cumulative population to the living standard measure (income or expenditure). It illustrates and helps to make inequality comparisons in terms of living standards. If p is the rank of an individual going from 0 for the poorest individuals to 1 for the richest ones, $Q(p)$ the living standard of the individual according to its rank p, and μ the mean of the living standard distribution, Duclos and Araar (2006) show that the Lorenz curve may be written as follows: $L(p)=\frac{1}{\mu}\int_0^p Q(q)\,dq$. $L(p)$ is the cumulative percentage of the total living standards of a cumulative proportion p of the population, given that individuals are ranked in increasing order of their own living standards.

The Gini coefficient is defined as being "equal to one minus twice the area under the Lorenz curve" (Kakwani, 1980). However, the formal definition of the Gini coefficient as given in terms of the Lorenz curve can be put in several alternative forms (for more details see, Nyagard and Sandstrom, 1981; Yitzhaki, 1998) However, it should be noted that the simplest and most popular form of the Gini coefficient used in the literature is based on the covariance between the welfare measure of an individual or household and the rank which that individual or household occupies in the distribution of this measure. Duclos and Araar (2006) show that the class of Gini inequality indexes (written as S-Gini) may be expressed as follows:

$$I(\rho)=\frac{-\operatorname{cov}\left[Q(p),\rho(1-p)^{(\rho-1)}\right]}{\mu}$$

Where ρ is the parameter of aversion to inequality. The more the value of ρ increases, the more emphasis is put on the lower tail of the income distribution, and hence on the position of the poorest individuals in a population. $Q(p)$ is the living standard of the individual according to his rank, p ; and p increases from 0 for the poorest individuals to 1 for the richest ones. μ is the mean of the distribution of living standards. For $\rho=2$, the standard Gini index is calculated as follows:

$$I(\rho=2)=\frac{2\operatorname{cov}\left(Q(p),p\right)}{\mu}$$

The Gini index varies from 0 (total equality) and 1 (total inequality). It can also be interpreted in several ways (for more details, see Sen, 1973, and Pyatt, 1976). Because of the preceding characteristics, the Gini coefficient is the most popular and the most interesting inequality measure.

Two main approaches are used to break down the Gini index.

The first consists of using the Shapley-value approach (See the Appendix for the presentation of Shapley's value). The application of this approach for the decomposition of distributive indices was introduced by Shorrocks (1999). From the standpoint of properties, the usefulness of this decomposition method is based on the additivity of its components which implies an exact decomposition where the residual deriving from interactions between components is attributed to components by a linear approximation.

The second approach is the analytical decomposition which consists of breaking down the Gini index into population sub-groups or income sources. This approach has been used in previous research works such as those of Bhattacharaya and Mahalanobis (1967), Pyatt (1976), and Silber (1989) for decomposition by population sub-groups, as well as those of Rao (1969), Lerman and Yitzhaki (1985), Podder and Chatterjee (2002) for decomposition by income sources.The presentation of the Gini index decomposition in the present study follows the Shapley-value approach.

Decomposition of the Gini index based on Shapley's method

This decomposition is carried out in two steps (Duclos and Araar, 2006). The first step consists of breaking down total inequality into total between-groups and total within-groups contributions.The second step amounts to expressing the total within-groups contribution as a sum of the within-groups contributions of each of these groups.

In the first step, it is assumed that Shapley's two factors are between-groups (C_{inter}) and within-groups (C_{intra}) inequalities, so that total inequality (I) may be written as (The decomposition of inequality into between-groups and within-groups inequalities is useful in checking the significance of each of these two components.A pronounced between-groups inequality reflects income disparities across groups. Conversely, if between-groups components are marginal, the disparities across groups are also marginal):

$$I = C_{\text{inter}} + C_{\text{intra}} \quad (1)$$

The procedure used to calculate the contribution of each of these factors is as follows:

- To eliminate within-groups inequality and calculate between-groups inequality ($I(\mu_1,...,\mu_G)$), use is made of an income vector in which each household has its group's mean income which is given by μ_g ;

- To eliminate between-groups inequality and calculate within-groups inequality ($I(y_i(\mu/\mu_g))$), use is made of an income vector in which the income of each household is multiplied by the ratio μ/μ_g . With this new income vector, the mean income of each group is equal to μ .

- To highlight the between-groups and within-groups inequalities simultaneously, use is simply made of an income vector in which the income of each household is equal to the mean of incomes.

The order followed to eliminate the factors is arbitrary. To eliminate this arbitrariness, Araar (2006) followed the Shapley's approach according to which one can start by eliminating either of the two factors. Based on this approach, the decomposition yields:

$$C_{\text{inter}} = 0.5\left[I - I(y_i(\mu/\mu_g)) + I(\mu_1,...,\mu_G)\right] \quad (2)$$

$$C_{\text{intra}} = 0.5\left[I - I(\mu_1,...,\mu_G) + I(y_i(\mu/\mu_g))\right]$$

Starting from this decomposition, we proceed to the second step in which we break down within-groups inequality into specific group components. As may be seen in equation 2 above, which defines the contribution of within-groups inequality, this decomposition is based on three inequality factors.

To eliminate arbitrariness in the sequence of eliminations of the marginal contribution of groups to total within-groups inequality, we use Shapley's approach for the three terms (that is the three inequality factors), and this decomposition yields:

$$C_{\text{intra}} = 0.5\left[I - I(\mu_A,\mu_B) + I(y_i^A(\mu/\mu_A), y_i^B(\mu/\mu_B))\right] \quad (3)$$

The same rule is used to determine the impact of eliminating the marginal contribution of each group, i.e. within-groups inequality is eliminated when the income of each household is equal to the mean income of its group. In this sense, we apply the same rule to the three terms as follows:

$$CA = \sum_{i=1}^{3} 0.25 C_{A:terme(i)} \quad (4)$$

$$C_{A:terme1} = \left[I - I(\mu_A, y_B) + I(y_A, \mu_B) - I(\mu_A, \mu_B)\right]$$

$$C_{A:terme2} = \left[I(\mu_A,\mu_B) - I(\mu_A,\mu_B) + I(\mu_A,\mu_B) - I(\mu_A,\mu_B)\right] = 0 \quad (5)$$

$$C_{A:terme3} = \left[I\left(y_i^A(\mu/\mu_A), y_i^B(\mu/\mu_B)\right) - I\left(\mu, y_i^B(\mu/\mu_B)\right)\right] \cdot + \left[I\left(y_i^A(\mu/\mu_A), \mu\right)\right] - I(\mu,\mu)$$

Absolute and Relative Contributions

Let CA_g be the absolute contribution of each group g to the Gini inequality index. This value provides the magnitude, in absolute value terms, of the contribution of group g . The relative contribution of each group to the Gini index is given by the relative contribution coefficient defined by the following equation:

$$CR_g = \frac{C_g}{I} \quad (6)$$

Data sources

The two household surveys used in this study, namely, the Household Consumption Budget Survey (EBC) and the Cameroonian Household Survey (ECAM1), are representatives at the national level and were conducted by the Cameroon Division of Statistics and National Accounting (DSCN) in 1984 and 1996, respectively.

The EBC survey covers the whole national territory and consists of a sample of 6000 households. However, only 5474 survey questionnaires were actually filled out by interviewing households. The survey plan was designed to be carried out in four stages. In the first stage, the primary units drawn proportionally to the size of the population were districts. In the second stage, the draw involved count zones proportionally to the number of segments provided for

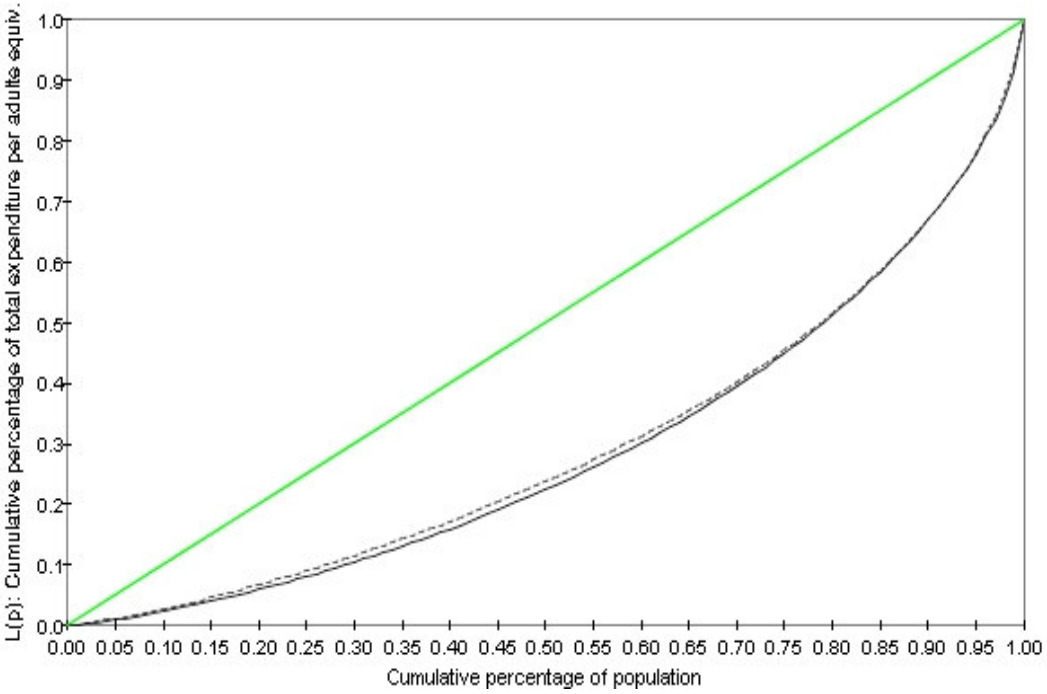

Figure 1. Lorenz curves. Cameroon (1984, 1996).

independently in the urban and rural parts of the district chosen in the first stage.In the third stage, it was an equiprobable draw of a segment or sub-zone in some units of the second stage. Lastly, in the fourth stage, households were selected from new files obtained during the update operation.Interviews lasted for 12 months between September 1983 and September 1984, broken down into four field trips of 3 months each. The survey questionnaire had 16 headings in all, several of which were designed to investigate social welfare in Cameroon.

ECAM1 survey was also a data-gathering survey covering the ten provinces of the country; it lasted for three months and collected a random sample of more than 1700 urban and rural households. It is a stratified survey with 2 stages at Yaoundé and at Douala (the country's political and economic capitals, respectively), and with 3 stages in the country's other cities, with the urban/rural distinction. Two types of questionnaires were drawn up, one for the cities and large cities, and the other for the rest of the country. As for the 1983/84 EBC, all these questionnaires were submitted to selected households and they had 11 sections of which several may be used to analyze social welfare in Cameroon (For more details about ECAM1 survey, see Fambon et al., 2005).

EMPIRICAL RESULTS OF THE GINI INDEX DECOMPOSITION USING SHAPLEY'S VALUE

We begin by presenting the evolution of inequality in household consumption expenditure per adult equivalent at the national level using the Lorenz curve. This curve illustrates the functional relationship between the cumulative proportion of income and the cumulative proportion of income units, assuming that income units are ranked in an increasing order of income.

The comparison of Lorenz curves (Figure 1) based on the distribution of total expenditure per adult equivalent shows that relative inequality slightly decreased between 1984 and 1996. In other words, the graph indicates that the Lorenz curve for total expenditure per adult equivalent in 1996 lies everywhere above that of 1984.This result indicates that Cameroon generally witnessed a slight improvement in living standards equality as measured by total expenditure per adult equivalent between 1984 and 1996.

The Gini index confirms the above results.It reveals a general downward trend of -1.6 percentage points in the inequality of total expenditures over the 1984-1996 periods (See Tables 1 and 2 below). As shown above, this slight decline in total inequality may be explained by the negative impact of the economic crisis which drove thousands of public and private sectors salaried workers to unemployment or to the informal sector of the economy where they joined the ranks of those who were already poor.

The data in Table 1 below show that inequality in total expenditure accounted for 42.2% of total expenditure in 1984, and it dropped afterwards to 40.6% in 1996.

The between-areas inequality component of total expenditure represented about 29.45 % of total expenditure in 1984,but it decreased by about 3.8 percentage points in 1996.Regarding the within-areas component,it witnessed a decrease from 70.5% in 1984 to 66.8% in 1996 or a decrease of about 4% over the study period.

Table 1. Decomposition of changes in the Gini inequality index by area (Standard of living measure = Total expenditure per adult equivalent).

	1984		1996		Difference 1984 vs 1996	
Gini	0.4218		0.4060		-0.0158	
	Shapley's approach					
	Contribution					
	Absolute	Relative	Absolute	Relative	Absolute	Relative
Between Areas	0.1242	0.2945	0.1349	0.3322	0.0107	0.0378
Within Areas	0.2976	0.7055	0.2711	0.6678	-0.0265	- 0.0378
Decomposition of within-Areas component						
Urban	0.0290	0.0688	0.1225	0.3017	0.0934	0.2328
Semi-urban	0.0644	0.1527	0.0180	0.0443	-0.0464	-0.1084
Rural	0.2042	0.4840	0.1516	0.3733	-0.0526	-0.1107

Source: Calculations by the author based on the 1983/84 Consumption Budget Survey (EBC) and the Cameroonian Household Survey (ECAM1), conducted by the Division of Statistics and National Accounts – Cameroon.

Table 2. Decomposition of changes in the Gini inequality index by stratum (Standard of living measure –Total expenditure per adult equivalent).

	1984		1996		Difference 1984 vs 1996	
Gini	0.4218		0.4060		-0.0158	
	Shapley's approach					
	Contribution					
	Absolute	Relative	Absolute	Relative	Absolute	Relative
Between strata	0.1281	0.3036	0.1380	0.3399	0.0099	0.0363
Within strata	0.2938	0.6964	0.2680	0.6601	-0.0257	-0.0363
Decomposition of the within-strata component						
Yaoundé	0.0150	0.0356	0.0236	0.0581	0.0085	0.0224
Douala	0.0138	0.0328	0.0545	0.1342	0.0407	0.1015
Autres Villes	0.0645	0.1528	0.0348	0.0858	-0.0296	-0.0670
Forêt	0.0406	0.0963	0.0391	0.0963	-0.0015	0.0000
Hauts Plateaux	0.0824	0.1954	0.0676	0.1665	-0.0148	-0.0289
Savane	0.0774	0.1834	0.0593	0.1460	-0.0181	-0.0375

Source**:** Calculations by the author based on the 1983/84 Consumption Budget Survey (EBC) and the Cameroonian Household Survey (ECAM1) conducted by the Division of Statistics and National Accounts – Cameroon.

If the decomposition of the within-areas inequality component of total expenditure in terms of share contribution according to area is considered, we may note that the urban area, taken as a whole, contributed about 7 percentage points to the total within-areas component of 70.5% in 1984, while the rural area share contribution accounted for up to 48% and the semi-urban area 15.3% respectively. Moreover, between 1984 and 1996, area share contributions to the change in the within-areas component increased by 23% in the urban area, while other areas rather witnessed significant falls in their share contributions to the change in the inequality of within-areas total expenditure, and they actually amounted respectively to 10.84 percentage points for the semi-urban area and 11.07 percentage points for the rural area.

An important remark emerges from the figures shown in Table 1 below. In effect, even though between-areas inequality as measured by the Gini coefficient between 1984 and 1996 proves to be relatively insignificant, about more than 66% of the inequalities in total expenditures were explained by the within-areas component of these inequalities. It thus follows that policies likely to achieve a concurrent and significant reduction in total expenditure

Table 3. Decomposition of the Change in the Gini Inequality Index according to Educational Level of Household Head (Living standard measure = Total expenditure per adult equivalent).

	1984		1996		Difference 1984 vs 1996	
Gini	0.4218		0.4060		0.0158	
Shapley's approach						
			Contribution			
	Absolute	Relative	Absolute	Relative	Absolute	Relative
Between groups	0.0882	0.2092	0.1389	0.3420	0.0506	0.1329
Within groups	0.3336	0.7908	0.2671	0.6580	-0.0665	-0.1329
Decomposition of within-groups component						
Primary education	0.1029	0.2440	0.0995	0.2450	0.0035	0.0010
Vocational Training	0.0121	0.0286	0.0190	0.0468	0.0069	0.0182
Secondary education 1st cycle	0.0213	0.0506	0.0375	0.0924	0.0162	0.0418
Secondary education 2nd cycle	0.0026	0.0063	0.0225	0.0555	0.0199	0.0493
Higher education	0.0032	0.0076	0.0211	0.0520	0.0179	0.0444
Others	0.1914	0.4538	0.0899	0.2213	-0.1016	-0.2325

Source: Calculations by the author based on the 1983/84 Consumption Budget Survey (EBC) and the Cameroonian Household Survey (ECAM1), conducted by the Division of Statistics and National Accounts – Cameroon.

inequalities in Cameroon should centre on the within-areas disparities in the distribution of income through area-specific policy considerations, although inequalities between the areas should not totally be neglected.

Table 2 presents the decomposition of the change in the inequality of total expenditure in Cameroon between 1984 and 1996 as measured by the standard Gini coefficient by using Shapley's method which presents an exact decomposition framework.

Total expenditure inequality was about 42.2 percentage points in 1984 and it dropped by about 1.6 percentage points between 1984 and 1996.The within-strata component amounted to about 70% of total expenditure in 1984 and it decreased by 4 to 66% in 1996, thus indicating that the within-strata component still accounted for the bulk of total expenditure inequality in Cameroon during the period. As to the between-strata component, it stood at about 30.36% in 1984 and increased by 3.63 to 33.99% in 1996.

The breakdown of the within-strata inequality component of total expenditure in terms of stratum contribution is also presented in Table 2.Yaoundé and Douala contributed less than 4 percentage points each to the total within-strata inequality component of 69.64% in 1984, whereas the Hauts-Plateaux stratum alone accounted for about 20%, followed by Savane (17 percentage points), other cities (16 percentage points) and Forêt (10 percentage points). Between 1984 and 1996, the strata share contributions to the change in the within-strata inequality component of total expenditure increased by 2 and 10 percentage points for Yaoundé and Douala respectively. During the same period, the share contributions of the other strata to the change in the inequality of within-strata total expenditure decreased instead.This reduction amounted to 7 percentage points for other cities; 4 percentage points for Savane, and 3 percentage points for Hauts-Plateaux stratum.

Three observations emerge from Table 2, although between-strata inequality as measured by the Gini coefficient between 1984 and 1996 is non negligible, more than two-thirds of total expenditure inequalities were explained by their within-strata components; policies whose objectives are to reduce total expenditure inequalities should focus more on within-strata disparities in the distribution of income, although policy considerations to reduce between-strata inequalities should not be neglected.

We expect the educational level of the household head to play a significant role in determining the welfare level of a household.In 1984, inequality in the distribution of living standards measured by the standard Gini coefficient was moderately high (see Table 3).

The decomposition of the Gini coefficient by level of education revealed that the within-groups inequality component contributed up to 79% to total inequality in 1984 and around 66% in 1996. The behaviour of the within-groups component caused a reduction in inequality of 7 and 13 percentage points in absolute and relative terms, respectively. Total between-groups inequality in the living standards distribution increased in absolute and

Table 4. Decomposition of the Change in the Gini Inequality Index according to the Gender of the Household Head (Living standard measure = Total expenditure per adult equivalent).

	1984		1996		1996 Difference vs 1996	
Gini	0.4218		0.4060		-0.0158	
Shapley's approach						
	Contribution					
	Absolute	Relative	Absolute	Relative	Absolute	Relative
Between groups	0.0026	0.0062	0.0113	0.0278	0.0087	0.0216
Within groups	0.4192	0.9938	0.3947	0.9722	-0.0245	-0.0216
Decomposition of within groups component						
Male	0.3549	0.8413	0.3525	0.8682	0.4864	0.0269
Female	0.0643	0.1525	0.0421	0.1037	-0.0222	-0.0488

Source: Calculations by the author based on the 1983/84 Consumption Budget Survey (EBC) and the Cameroonian Household Survey (ECAM1), conducted by the Division of Statistics and National Accounts – Cameroon.

relative terms by 5 and 13 percentage points respectively in 1984 and 1996.

A decomposition of the within-levels component of total inequality into different levels of education over the study period generally indicates that only the undefined level of education group showed a reduction in inequality contributions in absolute and relative terms to within-levels inequality.

Inequality among individuals with a primary level of education decreased but marginally.These results could perhaps conceal a lot of information,for the undefined level of education group seems to contribute for more than 45 and 22 percentage points to within-groups inequality between 1984 and 1996 respectively, thus indicating a decrease of 33 percentage points in the change in within-levels inequality.

The design of gender-sensitive policies requires the breakdown of inequality according to the gender of the household head.In Table 4,households managed by women are more heterogeneous in the way they usually spend their money than households managed by men. The latter accounted for 88% of the population spent a little less money than the national average, and contributed for about 86% to within-groups inequality between men and women, which largely explains total inequality.Disparity in average living standards between the genders is negligible (about 0.1%) in the explanation of total inequality.

Between 1984 and 1996, the Gini coefficient decreased for households managed by both men and women, but much more so for those managed by women (see Table 4).As indicated by the data in Table 4, the contribution of changes in within-groups inequality between genders is very negligible in explaining the evolution of total inequality. This result shows the ineffectiveness of policies that focus mainly on the equalization of average capacities between genders. The reduction of total inequality is explained by the differences observed within households headed by men. The contribution to within-gender inequality remained significant between 1984 and 1996 in explaining overall inequality.

Inequality in the distribution of living standards according to the age of the household head in 1984 and in 1996 is presented in Table 5.

Inequality such as defined by the Gini index seems to decrease with the age of the household head.This may be due to the economic crisis and the implementation of government austerity measures such as public and sector redundancies,salary cuts and forced retirement which increased unemployment,so that the "50 or more" age group disproportionally joined the ranks of the poor, thus reducing inequality through the general pauperization of the population.Decomposition results of the Gini inequality measure according to age of the household head shows the overwhelming contribution of within-age groups' inequalities to the explanation of total inequalities.

The decline in the overall inequality of total expenditure between 1984 and 1996 is mainly explained by the less than 35 and between 35 and 50 age groups.The contribution of the between 35 and 50 age groups to this decline is very marginal in spite of the fact that they contribute to a large extent to the explanation of within-groups inequalities during the study period.The "more than 50" age group rather contributes to the increase in within-groups inequality, and hence to overall inequality in total expenditure during the study period.

As a consequence,an increase in the number of the elderly would cause the distribution of expenditures to become less equal in Cameroon.Lastly, given that the population of the elderly will increase in the years to come, the rate of increase in inequality should also be expected to rise. Appropriate measures should therefore be taken to reduce the inequality linked to some population groups.

Such measures may include setting up some safety nets

Table 5. Decomposition of the Change in the Gini Inequality Index by Age Group (Living standard measure = Total expenditure per adult equivalent).

	1984		1996		Difference 1984 vs 1996	
Gini	0.4218		0.4060		-0.0158	
Shapley' approach						
	Contribution					
	Absolute	Relative	Absolute	Relative	Absolute	Relative
Between groups	0.0282	0.0669	0.0556	0.1368	0.0274	0.0699
Within groups	0.3936	0.9331	0.3505	0.8632	-0.0431	-0.0699
Decomposition of within-group component						
Less than 35	0.1005	0.2383	0.0718	0.1769	-0.0287	-0.0614
35-50 years	0.1641	0.3890	0.1541	0.3795	-0.01	-0.0095
More than 50	0.1290	0.3058	0.1244	0.3064	-0.0046	0.0006

Source: Calculations by the author based on the 1983/84 Consumption Budget Survey (EBC) and the Cameroonian Household Survey (ECAM1), conducted by the Division of Statistics and National Accounts – Cameroon.

to help the elderly.

Conclusion and policy implications

The aim of this paper was to analyze the evolution of inequality in household consumption expenditure in Cameroon between 1984 and 1996 and to decompose it into between- and within components using the Sharpley-value decomposition approach.For this purpose, we used the total expenditure data provided by the 1983/1984 Household Consumption Budget (EBC) survey and the 1996 Cameroonian Household Survey (ECAM1).The use of expenditure data was motivated both by the un-availability of complete household income data and by the fact that they reflect welfare better than income in the case of Cameroon.The analysis of the evolution and sources of inequality was based on the calculation and decomposition of the Gini index according to the residence area (rural,semi-urban,and urban),the stratum, age,the educational level,and the gender of the household head.

In general, the results of the study indicate that, at the national level, inequality in total expenditure per adult equivalent decreased from 42.18% in 1984 to 40.60% in 1996 or a slight decline of -1.57 percentage points during the study period.This decline may be explained by the negative impact of the economic crisis which drove thousands of public and private sectors salaried workers to unemployment and to the informal sector of the economy where they joined the ranks of the poor.In fact,it may be said that,negative economic growth during the crisis,not only increased the incidence of poverty,but it also caused a slight redistribution of income or expenditure in favour of equality in the distribution of income at the national level.

As to the results derived from the decomposition of total expenditure inequality according to residence area, stratum,educational level,age,and gender of the household head, the study showed that the contribution of the within-groups component of total inequality overwhelmingly dominates the between-groups contribution to overall inequality at the national level both in 1984 and 1996.

Decomposition results of the within-groups component of the 5 household socio-economic characteristics analyzed in the study shows that the rural area and the Hauts-Plateaux strata contribute the most to within-areas and within-strata inequality respectively, while the primary educational level,the male gender,and household heads in the “between 35-50”,and “more than 50” age groups contribute preponderantly to within-educational levels, within-genders, and within-age groups inequalities, respectively.

Generally speaking, these findings suggest that policies whose objectives are to reduce total expenditure inequalities should focus more on within-areas and within-strata disparities than on between-areas and strata disparities in the distribution of income, although policy actions in favour of between-areas and between-strata disparities should not be neglected.Moreover,since urban inequality is likely to play an increasing role in the contribution to within-groups inequality, and hence to overall inequality, the reduction of urban inequality is another decisive policy measure to be taken if overall household inequality in total expenditure in Cameroon is to be reduced at the national level.

For urban areas in general, such policies may involve job creation, the formalization of the informal sector through access to formal sector financial services and microfinance institutions, and policy actions conducive to private sector development as an engine of growth and development, should all the more be implemented since the State has already disengaged from the productive of the economy. As to rural areas, rural sector development through physical and social infrastructure building, the

provision of agricultural finance for the acquisition of production inputs to enhance output and facilitate the marketing of agricultural products would solve most of the problems of rural areas.Given that only about 35% of the household heads surveyed had a primary educational level, an improvement in the general educational level of the population would be,*ceteris paribus,*a significant contribution to the reduction of overall inequality in Cameroon.However,it is an opportunity to note that educational systems in developing countries may cause an increase in the inequality level,since the opportunity costs of elementary education are higher for poor stu-dents than for rich ones.For this reason, the achievement of this goal requires the reduction or the outright eli-mination of school fees in public schools at least at the primary level of education and even at the secondary level if public subsidies to education are available.

As far as between-genders inequality in total expenditure is concerned, decomposition analysis showed the surprising result that the latter did not contribute to the reduction of overall inequality, whereas the within-genders contribution to total inequality decreased marginally from 99.38 to 97.22% between 1984 and 1996, thus indicating that gender inequality seemed to be marginal in Cameroon, contrary to the results arrived at in many other developing countries where women household heads usually are more disadvantaged than men because of limited access to education, job opportunities, and capital.

However, even if between-genders inequality were marginal in Cameroon as seen above, the predominance of within-genders expenditure inequality in the country suggests that policies whose aims are to reduce gender inequality should focus on within-genders inequality. Since most men and women in the rural and urban areas operate in the informal sector of the economy and are still mainly engaged in the production and marketing of agricultural products and other wares, such policies may involve above all increased access to formal banking financial services, microfinance, and technical assistance for them to acquire production inputs and credit necessary to run their businesses effectively and efficiently to achieve a modicum of profitability.

With regard to age groups,the results of the study showed that the decline in the overall inequality of total expenditure between 1984 and 1996 is mainly explained by the less than 35 and between 35-50 age groups.The contribution of the between 35-50 age group to this decline is very marginal in spite of the fact that they contribute substantially to the explanation of within-groups inequalities during the study period. As for the “more than 50” age group, it contributes to the increase in within-groups inequality, and hence to overall inequality in total expenditure during the study period. As a consequence, an increase in the number of the elderly would cause the distribution of expenditures to become less equal in Cameroon.

The most serious problems affecting most age groups in Cameroon are unemployment and underemployment, which were exacerbated by the economic crisis and still endure despite the advent of economic recovery in 1996, notably among women and the youth.Furthermore, given that the population of the elderly may increase in the years to come, the rate of increase in inequality may also be expected to rise.Appropriate measures should therefore be taken to reduce the inequality linked to vulnerable age groups in the population.Such policies necessarily include job creation for the active population and the institution of some kind of national medical insurance and social security for the elderly.

In the final analysis, all of the policies suggested above to reduce inequality in Cameroon cannot be implemented without sustained economic growth and good macroeconomic management performance to maintain economic stability and avoid serious economic crises such as the one witnessed during the period retained for the present study.It is to be noted that, even though it is generally thought that poverty and inequality go hand and in hand,this is not necessarily the case owing to the presence of economic growth and redistributive effects.The reduction of inequality in Cameroon, as in most African countries,therefore depends not only on the design and implementation of growth policies that are favourable to poverty and inequality reduction,but also on the political will of decision makers who should be motivated to optimize the social welfare for their populations while achieving social justice in terms of equity in the distribution of income.

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Appendix

Shapley's Value

Shapley's value is a solution concept widely used in cooperative game theory (Owen,1977; Moulin,1988; Shorrocks, 1999).Consider a set N of m players who must share a surplus or a cost.To carry out this sharing,the players may gather together to form coalitions, that is, sub-sets S and V .The forces of each coalition express themselves in the form of a *characteristic function* v .For any coalition S , $v(S)$ measures the share of the surplus that S may obtain without resorting to an agreement with players belonging to other coalitions.The problem to be solved is the following: how should the surplus be shared out among the players?

According to Shapley's approach (1953), the value of player k given by the characteristic function, is expressed by the following formula:

$$C_k = \sum_{s \in S} s! \frac{(m-s-1)}{m!} MV(S,k) \text{ and } MS(S,k) = \left(v\left(S \bigcup (k)\right)\right) - v(s),$$

and by convention , $0! = 1$ and $v(O) = 0$. (7)

The term $MV(S,K)$ is equal to the marginal value generated by player k after his adhesion to coalition S .What will then be the marginal contribution expected from player k ,given the different coalitions possible that may be formed,and to which the player may adhere?

First of all,the size of coalition S is limited so that $s \in (0, m-1)$ .Suppose that the m players are randomly ranked following an ordering σ such that: $\sigma = (\sigma_1, \sigma_2, \sigma_2, ...\sigma_{k-1}, \sigma_k, \sigma_{k+1}, ...\sigma)$, and that they are eliminated in succession in that order.The elimination of players leads to a decrease in the share which goes to the group that is not yet eliminated. When coalition S is made up of s elements, we can measure the value *v*(*S*) that goes to coalition S only when the first s elements of σ are exactly the elements of S .The weight of coalition S will be measured by the probability that the first s elements of σ are all elements of S .This probability is obtained by dividing the number of orderings whose first s elements are all elements of S by the number of total orderings possible. The number of orderings possible corresponds to the number of permutations of m players taken m at a time, which yields $m!$.

For each of the permutations possible of the m players (i.e. m !), the number of times the same first s players are located in the sub-set or coalition S is given by the number of permutations possible of the s players in coalition S , that is $s!$.

For each permutation in coalition S ,we find $(m-s-1)!$ permutations for the players who top up coalition *S*.

The expected marginal value produced by player k after his adhesion to a coalition S is given by equation (7)

For each position of factor k , there are several possibilities of forming coalitions S from the $m-1$ players (i.e. the m players without player k). This number of possibilities is equal to the combination C_{m-1}^{s} .

How many marginal values would we have in order to calculate or assess the expected marginal contribution of a given factor such as factor k ?

As the ordering of players in coalition S does not affect the contribution of player k once he has adhered to the coalition, the number of calculations required for the marginal values is reduced

from $m!$ to $\sum_{s=0}^{n-1} C_{m-1}^{s} = 2^{m-1}$

The equality $\sum_{s=0}^{n-1} C_{m-1}^{s} = 2^{m-1}$ is easily obtained from Newton's binomial theorem.

In fact,the formula of Newton's binomial is written as: $(a+b)^m = \sum_{s=a}^{m} C_n^s a^{m-1} b^m$, $\forall (a,b) \in R^2, \forall m \in N$. Raising $(a+b)$ to the m power is equivalent to multiplying m identical binomials $(a+b)$ .The result is a sum where each element is the product of *m* of type *a* + *b*.Therefore, the terms are of the form $a^{n-p} b^p$ .Each of these terms is obtained a number of times equal to C_n^p , which represents the number of times we can choose p among m elements. When $a = b = 1$, we will have: $(1+1)^m = \sum_{s=0}^{m} C_m^s = 2^m$. As a consequence, we may conclude that $\sum_{s=0}^{n-1} C_{m-1}^s = 2^{m-1}$.

Details on Shapley's value are given in Moulin (1988, Chapter 5). This value serves as a framework for many types of decompositions.For instance, Chantreuil and Trannoy (1999) make use of it to break down inequality by sources of income.Shorrocks (1999) generalizes its use to decompose any index *I* representing a poverty or inequality measure.